Resolving Colds to Advanced COVID with Methylene Blue

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Resolving Colds to Advanced COVID with Methylene Blue

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OMNS (Feb 4, 2023) Linus Pauling first coined the word "orthomolecular" in an article he wrote in the journal *Science* in 1968. Quite simply, ortho means correct or right, and molecular refers to the simplest building block of any substance. Dr. Pauling started the whole concept of orthomolecular medicine by pointing out that the only true way to prevent or treat any medical condition is to restore whatever important natural substances

(nutrients, vitamins, minerals) that are depleted. And the corollary of this approach to healthcare is that no patient is sick because they have low levels of any synthesized agents (prescription drugs) that are not found in nature.

As a rule, a pharmaceutical agent impacts some metabolic pathway in such a manner that helps to alleviate a symptom *without lessening* the pathology causing that symptom to be present. With the rarest of exceptions, pharmaceutical agents reliably allow a disease to continue to evolve while one or more of the associated symptoms are chronically suppressed. However, when deficiencies of important natural substances are corrected, positive clinical results not known to (or acknowledged by) traditional medicine are consistently seen. Clinical improvement following the resolution of such deficiencies typically indicates that the underlying disease is no longer progressing and possibly even reversing. And depending on how chronic the condition was, an eventual return to physiological normalcy might also result.

Probably the most noteworthy of chronically depleted nutrients in a large majority of people around the world is vitamin C. The literature supporting its positive health impact when properly administered is massive and extending over 80 years now. [1] The benefits of vitamin C and many other important orthomolecular substances continue to be suppressed and even belittled in biased and sometimes frankly fraudulent medical articles. The patented drugs that are promoted relentlessly make knowing the benefits of an inexpensive natural remedy difficult for even sincere healthcare practitioners who want the best for their patients.

Such "education" on the "essential" role of pharmaceutical drugs begins in medical and osteopathic schools, and it never stops. Furthermore, without the endorsement of traditional medicine, many healthcare practitioners are reluctant to use such agents even when they are fully aware of the benefits. Also, as evidenced by the past three years of the COVID pandemic, it appears that a majority of pharmaceutical companies, along with too many hospitals and far too many physicians, place profits far ahead of patient welfare. The application of scientifically-based treatment protocols, many based on orthomolecular principles, continues to be ignored and even suppressed.

Methylene blue (MB), a powerful antioxidant with a clinical impact comparable to even vitamin C, is a major exception to the principles of orthomolecular medicine. It is not produced in the body, and it is not naturally present in any animal or plant. Nevertheless, its documented beneficial health effects rival that of any other known substance, whether normally found in nature or coming out of a laboratory. Just like vitamin C, the true benefits of MB in so many different diseases remain unappreciated and unused by most clinicians, even though it has been safely utilized in many patients for a much longer time than even vitamin C.

The parallels between vitamin C and MB are also reflected in the fact that administering them in *either* their reduced or oxidized form is comparably beneficial to the patient. This is because the dose of vitamin C or MB is less designed to give a one-time boost to the electron stores of the body than it is to make sure newly-assimilated electrons get optimally distributed throughout the body.

A quality nutrition program is the best **source of *new* (versus recycled) electrons in the body. And the qualities of super antioxidants like vitamin C and MB serve to make sure those electrons are optimally distributed and repeatedly exchanged in redox reactions throughout the body, which is the essence of optimal health.**

For those who appreciate metaphors, good nutrition is the product (electron) manufacturing facility, and the premier antioxidants (vitamin C, MB) are the trucks that assure the optimal distribution and delivery of those products throughout the body (country). While it is logical and correct that delivering the antioxidant in its reduced form brings even more electrons into the body, the oxidized form is also highly effective without those extra electrons since it is the distribution and repeated give-and-take of electrons throughout the antioxidant matrix inside the cell that is of greatest therapeutic value. A clear example of this is seen in animal studies where dehydroascorbic acid (DHAA), which is the oxidized form of vitamin C, readily minimizes brain infarct size from induced ischemic stroke, facilitating rapid recovery. In fact, these studies also show that there is a precipitous decline in reduced vitamin C in the ischemic brain which is *reversed* by the infusion of DHAA. [2]

However, the presence of elevated blood levels of DHAA reported in patients with infectious disease does not mean DHAA is toxic *per se*. Rather, such elevated levels are just a reflection of increased oxidative stress in such a patient, not the cause of it. [3] Furthermore, any negative impact that DHAA has been reported to have in some *in vitro* studies does not reliably predict the positive effect that DHAA has in the intact plant, animal, or human, as such test tube studies are not receiving an ongoing new intake of electrons from quality nutrition or sun exposure. [4] Like the ascorbic acid and DHAA forms of vitamin C, the powerful clinical impact of MB appears equal whether administered in its oxidized (methylene blue) or reduced (leucomethylene blue) forms.

Methylene Blue (MB): A Brief History

Methylene blue (MB) is the first drug to be tested and used in humans. Chemically known as methylthioninium chloride, it was first synthesized in 1876, and it was used as an industrial dye. It was later found to be an excellent dye for staining microbes and human tissues as well. In 1891 it was found to be very effective as an anti-malarial agent by Paul Ehrlich. Of note, Ehrlich first coined the term "magic bullet" to refer to how effectively MB targeted and accessed the nervous system. [5] It has since been established to have a selective affinity for the nervous system, although it is highly effective in reaching all cells in the body.

As a powerful antioxidant with the ability to target the brain, MB was used as an antipsychotic drug for 50 years before phenothiazine became the first "official" antipsychotic drug. [6] It continues to be used as a dye for the staining of biological tissue specimens as well as a diagnostic tool in surgical procedures. [7] It has also been established to have numerous and very significant therapeutic purposes for a wide range of medical conditions. Some of the more significant conditions to be consistently and successfully treated by MB include the following:

- Infections, from minimal to life-threatening, including those having progressed to septic shock. Also, acute respiratory distress syndrome (ARDS) and hypoxemia secondary to COVID or any of multiple different pathogens [8,9]; also used for disinfection of plasma to be used for transfusion [10-12]

- Mitochondrial dysfunction [13-15]
- Depression, dementia, psychosis, impaired memory, as well as multiple acute and chronic neurological conditions [16]
- Methemoglobinemia, in which the oxygen-carrying capacity of the blood is critically depleted. [17] MB has FDA approval as a first-line therapy for this condition. [18,19]

Antioxidant Extraordinaire

An ideal antioxidant is one that is equally stable chemically in either its reduced or oxidized state, while having physical access to all the oxidized biomolecules in the body. Such a quality allows the continued giving and taking of electrons throughout the cellular and extracellular spaces, as that molecule does not resist being either reduced or oxidized. This redox (reduction-oxidation) property helps to conduct electron flow inside the cells. This helps to generate and sustain the microcurrents (a current is literally an electron flow) that have been identified inside cells, which work to maintain healthy transmembrane voltages. A sick cell always has a low transmembrane voltage, which directly reflects a redox balance skewed toward oxidation, with a limited influx of new antioxidant (nutrient) molecules available to deal with any new pro-oxidant (toxic) molecules. Normal transmembrane voltages are critical in maintaining healthy ion channels, transporters, pumps, and enzymes in the cell. [20] They are also critical for the optimal synthesis of ATP. [21]

A toxin always works to cause oxidation wherever it is found, or ends up. It is always pro-oxidant in its chemical impact, as it seeks to oxidize a biomolecule and then keep the electron it has "robbed." The electron it acquires makes the toxin *much more stable chemically*, and such a reduced toxin will not give up the electron again to another oxidized, or electron-depleted, biomolecule. This means that the electron-sated toxin will never redonate its electron to an oxidized biomolecule, as would occur with an electron-sated, or reduced, antioxidant molecule.

In addition to increasing the numbers of oxidized biomolecules, this retention of electrons by toxins also impedes/decreases electron flow (microcurrents) since the newly acquired electrons are tightly held and never again released in the manner of an antioxidant that is continually giving and taking electrons. An antioxidant like vitamin C decreases the total

number of oxidized biomolecules and supports optimal microcurrents, and a toxin does the opposite. [22]

It is the antioxidant properties of MB that results in the impressive clinical impact it has on so many conditions. In this regard, there is a striking parallel in what MB can do in the body with what vitamin C can do. Both vitamin C and MB are small molecules, and they effectively reach every cell in the body. However, MB requires no active or passive cell wall transporters as does vitamin C, and it has both lipid-soluble and water-soluble characteristics. Because of this, MB passes easily through lipid-rich cell walls, after which it disseminates throughout the water-based cell. [23,24] Also, while both MB and vitamin C access the brain, MB has been found to have a brain concentration up to tenfold higher than in the serum as quickly as one hour after intravenous administration. [25] Uptake is very rapid in the other organs as well. [26]

MB also has well-documented antitoxin properties like vitamin C, but the studies documenting them are much less prolific than those showing the similar effects of vitamin C on pro-oxidants and other poisons. MB helps protect the kidneys against the toxicity of the chemotherapeutic agent, cisplatin. [27] MB has also been shown to protect the brain against the toxicity of another chemotherapeutic agent, ifosfamide. [28,29] It also was shown to effectively treat the encephalopathy induced by ifosfamide after it had developed. And even though there is not an abundance of articles demonstrating the ability of MB to neutralize toxins and repair toxic damage, multiple researchers recommend it be routinely available as an emergency antidote for general use. [30,31]

Many toxins also inflict harm in some individuals by the formation of methemoglobin with a reduction of oxygen delivery to the tissues. Such toxin excesses or poisonings can be effectively treated with MB, as it is already the treatment of choice by many clinicians for methemoglobinemia. MB is always a good partner to be administered along with vitamin C for any toxin excess or overdose. [32,33] The addition of magnesium with MB and vitamin C to overdose patients offers additional protection against the development of fatal arrhythmias that can occur before the MB and vitamin C can resolve and block further toxic impact. [34]

Ideal Shock Therapy

Methylene blue is exceptionally beneficial for both infections in general and for hypotensive shock. This makes it a particularly optimal therapy for the very common cause of intensive care unit death around the planet: septic shock.

Refractory septic shock, a state of disseminated infection with vascular collapse and hypotension often *unresponsive to all traditional measures*, consistently responds positively to MB therapy, sometimes saving the patient from otherwise certain death.

As with vitamin C and many other non-traditional treatments, nearly all clinicians simply will not take the "leap" from clear-cut positive results in the literature to the application of those results in their patients. At best, they use these non-traditional therapies almost like a final gesture that they have done everything possible to save the patient, even though those therapies have little to no toxicity and should not be relegated to the last option in a treatment protocol. And, of course, this only applies to the clinicians who are even remotely aware of the existence of the data showing how effective and nontoxic these non-traditional therapies are. The many pearls in the medical literature remain completely unharvested by most clinicians. And many more clinicians are very diligent in doing everything possible to maintain the "mainstream status quo" to the point of ignoring and even suppressing anything that might threaten it.

An experienced and honest clinician will tell you that just one dramatic case report that is accurately reported has enormous value. When a patient is on the verge of death despite all that has been done, and one single intervention quickly stops the clinical deterioration and starts a clear recovery, the alert clinician does not need a large prospective, double-blind, and placebo-controlled clinical trial to take such a clinical response seriously. Such a trial would be unethical when the placebo group is not being given the benefit of some inexpensive, nontoxic, and highly effective agent. Especially in the setting of an advanced and rapidly progressing infection with unresponsive shock secondary to sepsis, seeing the patient normalizing only a short time after a treatment is administered compels serious attention.

A clear example of such a case report was reported on a 38-year-old male patient who presented with bilateral pneumonia that subsequently worsened and resulted in bacteria (*Klebsiella pneumonia*) being released into the bloodstream (septicemia). Lethargic with low blood oxygen when admitted to the hospital, he was given IV fluids with insulin and antibiotics. The oxygen levels continue to decline with increased difficulty breathing, and he was then intubated and supported on a ventilator. Hypotension requiring vasopressor infusion ensued. Broader antibiotic coverage was added. Metabolic acidosis with declining renal function followed, and a few hours later he had a cardiac arrest. Four hours after regaining a heart rhythm and only 25 hours after initial presentation, extracorporeal membrane oxygenation (ECMO) support was started. Nevertheless, critically low blood pressure *unresponsive* to multiple vasopressors continued.

At this point in time, a 172 mg IV bolus of MB was administered, and an infusion of MB at 0.51 mg/kg/hour was maintained for the next 10 hours. Blood pressure *quickly improved* and vasopressor support could be decreased. At the conclusion of the infusion, the clinical status stabilized for another 22 hours, but fever with a dropping blood pressure unresponsive to combinations of vasopressors at the highest doses returned. The MB infusion was restarted and blood pressure *again responded promptly*. This time the infusion was continued for 54 hours, and about seven days after this longer infusion was completed the patient was fully recovered and discharged from the hospital. [35] Another impressive case report on a clinically similar patient showed that MB had to be continually infused for a full 120 hours to prevent repeated clinical relapses, after which the patient stabilized and was eventually discharged. [36]

These case studies, in which the patients effectively serve as their own controls, showed clear improvement on MB when severely ill, clear deterioration back to a life-threatening point after MB discontinuation, and prompt improvement with complete clinical resolution when the MB was restarted and continued for a long enough period. No sincere and competent clinician giving his/her highest priority to patient welfare would ignore the importance of such a clinical response when treating similar patients in the future. And this is especially the case when it is realized that MB, dosed appropriately, has an impeccable safety profile, just like vitamin C. Also, like vitamin C, MB also *enhances antibody*

production in the body. [37] This begs the question: Why not use MB *first* in such situations, rather than last, or never?

Multiple studies have demonstrated the benefits of MB in stabilizing and even resolving septic shock, which is the worst stage that any infection can reach before the inevitable progression to death. No reports of MB worsening the overall clinical status of septic patients could be found. The studies consistently show that MB always improves hypotension when appropriately administered. Furthermore, it has been shown that MB improves survival in shock of all causes (vasodilatory shock), including the shock of advanced sepsis. [38]

The refractory hypotension in septic shock is consistently seen in the setting of excessive nitric oxide production, which causes too great a decrease in vascular tone. [39] MB promptly counteracts this in restoring normal blood pressure. [40] Furthermore, over 120 years of MB use has clearly established the lack of significant toxicity. Toxic levels exist, as with nearly every other agent (including water), but the amounts needed are far beyond the recommended dosing in established treatment protocols. [41-43]

An open-minded clinician reviewing the literature for the first time to learn about the best treatment for septic shock would certainly utilize methylene blue as a first-line agent. Even low doses of MB and one-time boluses of MB consistently show clear benefit in septic shock. However, the clinical response is much better and consistently achieved with a properly-dosed continuous infusion. [44,45] Septic shock still claims a lot of lives regardless of the therapy, and some clinical studies add MB seemingly as a last-ditch afterthought, after which MB is then reported to be ineffective for improving survival. And even now, some of the most recent clinical research continues to assert that "more studies are needed" on the impact of MB in septic shock, even though the very positive research on MB and septic shock now spans ***decades***. [46-55] MB infusions in hypotensive neonates have also been shown to increase blood pressures rapidly and safely. [56-58]

The impact of MB on septic shock was addressed above in some detail since a patient cannot really be much sicker than having severe hypotension with massive infection and enormously increased oxidative stress throughout the body. However, it is important to

realize that MB has also been shown to be very effective in treating different types of hypotensive shock that are unrelated to advanced degrees of infection. [59] Shock with unresponsive hypotension secondary to the ingestion of multiple drugs has responded rapidly to MB infusions, allowing the weaning of other vasopressor agents. [60,61] Shock secondary to anaphylaxis also responds well to MB. [62] One patient with profound refractory hypotensive shock following a dihydropyridine calcium channel blocker overdose only responded positively to MB infusion and was eventually discharged. Prior to the MB infusion, no improvement in blood pressure was seen with saline infusion, several doses of calcium gluconate, glucagon, various vasopressor agents, and even high-dose insulin euglycemic therapy over a period of several hours. [63] Another type of hypotensive shock, cardiac vasoplegia, is also sometimes seen following cardiac surgery. This is effectively treated by methylene blue as well. [64-66]

All forms of hypotensive shock should be treated with MB, and it should be part of the treatment protocol at the outset. It should not just be held back as a last-ditch intervention to save the patient. [67]

Regarding ARDS secondary to COVID, a massive production of pro-inflammatory agents known as a cytokine storm typically precedes imminent death if not effectively terminated and neutralized. [68,69] MB has been *uniquely* shown to inhibit the production of all three of the major classes of pro-oxidants involved in the cytokine storm clinical picture (reactive oxygen species [ROS], reactive nitrogen species [RNS], and cytokines). [70-72] And as a potent antioxidant, MB is highly effective in neutralizing the wide array of pro-oxidants that have already been produced in the ARDS lungs. MB also combines well with other antioxidants in providing clinical benefit. MB combined with vitamin C and N-acetyl cysteine was very effective in treating advanced COVID. [73]

Furthermore, patients who were severely ill with COVID but showing a steady clinical recovery still greatly benefit from MB. Very many "recovered" COVID patients have significant neurocognitive problems that are lessened or even blocked with adequate dosing of MB. With the known antioxidant properties of MB along with its predilection for targeting increased oxidative stress in the nervous system, it should be part of any COVID treatment, *regardless of how well the infection is responding to other therapies*. [74,75]

MB, Pathogens, and Photodynamic Therapy (PDT)

Logically, considering its documented impact on advanced septic shock, MB has also been shown to readily kill and/or neutralize a wide range of pathogens. While it can achieve this as a monotherapy, it is enhanced in effectiveness when accompanied by photodynamic therapy (PDT). A protocol using MB with PDT has even been shown to eliminate intracellular pathogens such as prions from the blood. [76] Another MB/PDT approach has shown rapid resolution of moderate to severe COVID in patients who did not require hospitalization. [77] MB has been shown to directly inhibit the initial binding of the COVID spike protein with the ACE2 receptor, a step necessary for the virus to enter the cell. [78-80]

MB and PDT have similar abilities to enhance mitochondrial function.

They both effectively bypass much of the Krebs cycle, producing normal amounts of ATP *while generating less oxidative stress* in the process of going through the entire cycle. [81] This can result in a complete clinical recovery from mitochondrial dysfunction syndromes.

ATP is produced in the mitochondria due to the shuttling of electrons through the four sequential complexes of the electron transport chain. The fourth complex transfers the electrons to the terminal electron acceptor, oxygen, ultimately resulting in ATP production. MB receives the electrons from the first complex and then directly passes those electrons on to cytochrome c in the fourth complex, bypassing the other complexes. [82] PDT with the photons from near-infrared light also energizes and enables the ability of cytochrome c to donate electrons to oxygen and result in the production of ATP. [83,84]

This bypassing of the earlier complexes of the electron transport chain lowers the production of reactive oxygen species (ROS) that would have been generated by those complexes, decreasing net oxidative stress in the cell. Yet, ATP production continues as though the entire electron transport chain was functioning normally. Less ROS production (mitochondrial oxidative stress) while achieving normal energy production goals is always a desirable, but rarely achieved therapeutic goal, and MB accomplishes this. [85,86] Because

of these effects, MB has been promoted as an anti-aging drug. [87] In cultured fibroblasts, MB clearly extends the life span of these cells. [88]

When the mitochondria can be made more efficient in producing energy, every metabolic process in the body is positively impacted. Any of the mitochondrial dysfunction conditions can benefit from MB and PDT, but especially MB due to its antioxidant nature and its ability to be taken regularly in a supplemental fashion without the need to spend time receiving various applications of light therapy. Furthermore, the actions of MB or PDT can also serve to help restore to normal an electron transport chain that had accumulated too much oxidative damage to function with normal efficiency (mitochondrial dysfunction) by decreasing the pro-oxidants (ROS) normally generated in the process of making ATP. [89]

However, there is no need to enhance every MB treatment with PDT to get optimal benefit if the MB is properly-dosed. MB has been shown to inactivate a very large number of viruses and other pathogens *in vitro*, with and without PDT. [90-96] MB is especially well-suited to dealing with viral infections, as it works

- *directly* against the virus, and
- *prevents* virus entry into cells, and
- *inhibits viral replication* after entry into the cell. [97]

As might be expected, the ability of MB to resolve viral infections indicates its likely positive impact in preventing viral infections as well. During the first wave of COVID-19 infections in France, it was reported that a cohort of 2,500 end-stage cancer patients being treated with a protocol that included 75 mg of MB three times daily had **NO** reported cases of influenza or COVID. [98]

There is significant research into methylene blue derivatives, which are also highly effective antiviral agents, including against viruses in the smallpox family. [99] Similarly, as MB is of clear-cut benefit in the treatment of depression, MB derivatives are being evaluated for the treatment of depression and neurological disorders. [100] Undoubtedly, the pharmaceutical industry recognizes the incredible abilities of MB, and much effort is going into finding related and effective agents that can be patented in order to generate astronomical profits.

MB and Cancer

On the PubMed website, the entry "cancer methylene blue" results in about 2,500 references. The articles that appear address primarily the role of MB in:

- Localizing (staining) of cancerous tissues and/or identifying as many involved lymph nodes as possible [101-105]
- The inhibition, inactivation, or killing of a wide array of different cancer cells in vitro, with and without the application of PDT [106-113]
- The superiority of MB in treating tumors in mice over traditional chemotherapy [114] In
- combination with PDT, the complete resolution of AIDS-related Kaposi's sarcoma skin lesions that had been unresponsive to chemotherapy with MB and toluidine blue [115] The direct treatment of cancer in dogs [116]
- The direct treatment of cancer in humans (only one article). While treating different
- types of cancer, the author asserted that MB reliably stopped pain secondary to cancer, improved general health, and added years of longevity. This was reported in 1907! [117] Another article asserted that MB was found to have anticancer effects over a century ago. [118] Of note, NO significant clinical applications of methylene blue on cancer patients were found other than the 1907 study cited above.

The efficacy of an inexpensive and safe agent like MB in many different and even advanced medical conditions make it an ideal general add-on or even stand-alone treatment most of the time. Furthermore, its potent anti-cancer effects *in vitro* make it especially puzzling why straightforward clinical studies on cancer patients with MB alone or in combination with other agents have not been reported. Even the positive effects of the much-ignored vitamin C on cancer patients have been published in many articles, yet the wonderful properties of MB have been known much longer now than vitamin C. The literature even suggests that MB could play a positive role in the treatment of cancer patients. [119]

MB: Safety and Dosing

The main side effect of MB is a blue discoloration of the urine. Rarely, some blue discoloration of the skin might be noticed when an *extended administration of highly-dosed MB* has occurred. Nevertheless, both effects are completely reversible in hours to a few days as the MB is eliminated out of the body. At very high doses of MB, some of the hemoglobin in the blood can be converted into methemoglobin, which is an abnormal state where MB is the treatment of choice when given at a lower dose. Even higher doses can result in greater toxic side effects, although higher doses can still be warranted for some critically ill patients who are not responding to other measures, as in terminal septic shock. Also, in patients with depression who are on drugs known as serotonin reuptake inhibitors (SSRIs), the addition of MB is not advisable, as some of these patients can develop a potentially life-threatening development known as serotonin syndrome. [120,121] However, MB is an effective anti-depressant by itself at low doses. [122]

Because they are highly effective antioxidants, both MB and vitamin C have been cited to rarely precipitate red blood cell hemolysis in patients with glucose-6-phosphate dehydrogenase (G6PD) deficiency. Nevertheless, closely-monitored administration of these agents in such patients typically avoids such hemolytic problems. In fact, when the G6PD-deficient patient presents with methemoglobinemia, a condition for which MB is typically the indicated treatment, properly-dosed vitamin C can resolve the condition without using MB. [123,124] Of note, G6PD deficiency resulting in hemolytic anemia from MB is very rare. In African children with malaria, MB therapy was shown to be very safe even when G6PD deficiency was present, as was the case with all 24 deficient children in one study. [125] Another study on 74 healthy but G6PD deficient adult men demonstrated no hemolysis when given MB along with chloroquine. [126]

Generally intravenous dosing is not necessary except for the critically ill patient, as in advanced hypotensive shock. There is no standard, fixed regimen of MB recommended in such situations. Boluses of 2 mg/kg of MB can be given, often followed by infusions of various duration depending on the clinical status and response of the patient. Such infusions are often in the range of 0.5 mg MB/kg/hour over an extended period, but as much as 4 mg MB/kg can be infused over an hour. An effective infusion spanning 120 hours has been reported. Others report that infusions can range from 0.25 to 2 mg MB/kg/hour. [127,128]

For less critical patients, as well as for outpatients, oral MB dosing can range from 10 mg to 50 mg, and that dosage can be taken from one to three times daily, adjusted up or down in dose size and frequency depending on clinical response. Even higher doses can be comfortably used for limited times. 200 mg daily to stabilize COVID patients that are not yet critically ill is a very reasonable dose. A reasonable regular supplementation dose can range from 5 to 15 mg daily for general good health if there is no targeted symptom or medical condition.

As a practical point regarding regular supplementation, a dose of 5 to 15 mg of 1% MB solution (0.5 to 1.5 milliliters) can be added to a small amount of water. A teaspoon of ascorbic acid powder (not sodium ascorbate) can then be added. After sitting for 15 minutes or less, the solution will completely clear with just a slight residual blue tint. [129] This can then be quickly consumed with little staining of the tongue that readily occurs with the MB solution alone. Regardless, the staining resolves quickly. But without the added ascorbic acid, it is best to just put the MB straight into something like tomato juice and then drink that.

Methylene blue is not a nutrient. While having some important similarities with vitamin C, there are differences, including a narrower tolerance limit and higher risk safety profile. Less than 2 mg/kg MB is generally regarded as safe; over 7 mg/kg is more likely to induce side effects. MB administration is to be done with the guidance of a qualified health care provider.

Recap

Methylene blue (MB) is an antioxidant with high redox activity, able to rapidly "oscillate" between its oxidized and reduced forms, much like that seen in vitamin C. A small molecule with fat- and water-soluble characteristics, it reaches all areas and cells of the body, and it especially concentrates in the brain and central nervous system. Like vitamin C, MB is highly effective in maintaining a healthy distribution of electrons already in the body, along

with the distribution of new electrons assimilated from the nutrients in a healthy dietary regimen.

MB has a unique ability among antioxidants and other biomolecules to relay electrons from the first complex in the energy-generating Krebs cycle in the mitochondria directly to the fourth complex. This allows the energized fourth complex to then produce ATP without the additional expenditure of energy in the steps of the electron transport chain that was bypassed. As such, MB allows dysfunctional mitochondria to produce healthy levels of ATP while producing less oxidative stress in the process, an optimal way both heal those mitochondria while promoting healing anywhere in the body. Photodynamic therapy (PDT) can also directly activate the energy production of the fourth complex in the electron transport chain.

Like vitamin C, MB is also a very powerful anti-pathogen It has been documented to salvage even late-stage COVID patients supported on ventilators with hypotension secondary to septic shock. For viruses in general, MB has the unique ability to attack the circulating virus, to block its binding of the virus to the cells of the body, and to stop the proliferation of the virus inside the infected cell. When administered as recommended, MB is exceptionally well-tolerated, with a safety profile that extends now over a period of more than 100 years of clinical use.

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